

CLAIMS

We claim:

1. A method of forming microstructures on the surface of polymeric material having a glass transition temperature (T_g) comprising the steps of:
 - 5 providing a web of polymeric material;
adapting the web of polymeric material to flow into and out of a stamp zone between a first platen and a second platen, wherein at least one of said first platen and said second platen having a stamper, each of said stampers having a flat surface with at least one microstructure image;
 - 10 heating said stamper to at least the glass transition temperature (T_g);
embossing said microstructure image on the polymeric material with said stamper; and
punching a hole through the web of polymeric material in the stamp zone during said embossing.
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2. The method of claim 1, wherein said punching includes positioning a punch nip on one of said first platen or said second platen.
3. The method of claim 1, wherein said punching includes setting a hole puncher in
20 said first platen and setting a hole punch receiver in said second platen, said hole puncher thrusting through said web and into said hole punch receiver.
4. The method of claim 1, wherein said punching includes setting a hole puncher in
25 said second platen and setting a hole punch receiver in said first platen, said hole puncher thrusting through said web and into said hole punch receiver.
5. The method of claim 3 or 4, wherein said hole punch receiver includes a web hole disposal zone.
- 30 6. The method of claim 1, wherein said heating said stamper comprises passing an electrical current through said stamper.

7. The method of claim 1, wherein said polymeric material has a thickness of about 0.6 mm or less.
- 5 8. The method of claim 7, wherein said polymeric material comprises an optical memory substrate material, said optical memory substrate material having an information structure.
9. The method of claim 7, wherein said embossing has a time duration of 5 seconds
10 or less.
10. The method of claim 1, wherein the temperature of the heated stamper is above the glass transition temperature (Tg) of the polymeric material when contacting the web.
- 15 11. The method of claim 10, further comprising the step of separating the stamper from the web when the surface of the web is at a temperature below the glass transition temperature (Tg).
12. The method of claim 9, wherein punching time is less than embossing time.
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13. The method of claim 1, said web traveling at a rate of between 1 inch per second and 30 inches per second into and out of said stamp zone.
14. The method of claim 1, the first platen having a first stamper and the second
25 platen having second stamper, each of said stampers having a flat surface with at least one microstructure image.
15. The method of claim 1, wherein said heating said stamper comprises positioning a heater adjacent to said stamper.

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16. The method of claim 1, wherein said heating said stamper comprises applying an induction field to said stamper.

17. The method of claim 1, further comprising the step of stabilizing the web of
5 polymeric material in the stamp zone during said embossing.

18. The method of claim 17, wherein said means for stabilizing comprises
intermittently stopping said web of polymeric material in said stamp zone during said
embossing of the microform image.

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19. An apparatus for use in making an optical memory device comprising:
a continuous web of polymeric material;
a first platen, said first platen in communication with said web of polymeric
material;
15 a second platen, said web of polymeric material adapted to flow between said first
platen and said second platen to form a stamp zone, said continuous web of
polymeric material adapted to flow between said first platen and said second
platen, at least one of said first platen and said second platen having at least
one microform image comprising a negative of optically detectable marks to
20 be created on said optical memory device, wherein each of the microform
images is embossed onto said web of polymeric material in the stamp zone;
and
means for punching a hole through said web in the stamp zone.

20. The apparatus of claim 19, further comprising means for stabilizing said
continuous web in the stamp zone during said embossing of the microform image.

23. The apparatus of claim 20, wherein said means for stabilizing comprises
intermittently stopping said web of polymeric material in said stamp zone during said
30 embossing of the microform image.

24. The apparatus of claim 19, said means for punching a hole comprising a punch nip set in the first platen.

25. The apparatus of claim 19, said means for punching a hole comprising a retractable hole puncher set in said first platen and a hole punch receiver set in said second platen, said hole puncher adapted to thrust through said web and into said hole punch receiver.

26. The apparatus of claim 19, said means for punching a hole comprising a retractable hole puncher set in said second platen and a hole punch receiver set in said first platen, said hole puncher adapted to thrust through said web and into said hole punch receiver.

27. The apparatus of claim 19, said first platen adapted to emboss the microform image onto the polymeric material in the stamp zone.

28. The method of claim 19, said second platen adapted to emboss the microform image onto the polymeric material in the stamp zone.

29. The method of claim 19, said first platen having a first microform image and said second platen having second microform image, wherein the first microform image and the second microform image are simultaneously embossed onto said web of polymeric material in the stamp zone.

30. The apparatus of claim 19, wherein the web of polymeric material is heated to a temperature above the glass transition temperature (T_g) of the polymeric material.

31. The apparatus of claim 19, wherein the temperature of the first platen is below the glass transition temperature (T_g) of the polymeric material when contacting the web.

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32. The apparatus of claim 31, wherein the stamper is separated from the web when the surface of the web is at a temperature above the glass transition temperature (T_g) of the polymeric material.